Amendments to the Claims

1.-27. (Cancelled)

28. (Previously Presented) A process for depositing a zinc alloy protective coating on aluminum or aluminum based alloy substrates which comprises

(A) Immersing an aluminum or aluminum based alloy substrate in an aqueous acidic immersion plating solution having a pH of from about 3.5 to about 6.5 and comprising zinc ions, nickel and/or cobalt ions, fluoride ions and at least one inhibitor containing one or more nitrogen atoms, one or more sulfur atoms, or both sulfur and nitrogen atoms provided the solution is free of cyanide ions for a period of time sufficient to deposit the desired coating, and

(B) removing the coated substrate from the immersion plating solution.

29. (Original) The process of claim 28 wherein the surface of the aluminum or aluminum based alloy is cleaned, etched and desmutted prior to immersion in the immersion plating solution.

30. (Original) The process of claim 29 wherein the cleaning is performed with an alkaline, acidic, or solvent cleaner, and the etching is performed with an alkaline or acid etching solution.

31. (Original) The process of claim 29 wherein the aluminum or aluminum based alloy is rinsed with water after each of the cleaning, etching, desmutting, and immersion plating steps.

32. (Previously Presented) A process for depositing a zinc alloy protective coating on aluminum or aluminum based alloy substrate which comprises

(A) immersing the substrate in an aqueous acidic immersion plating solution having a pH of from about 3.5 to about 6.5 and comprising:

from about 1 to about 150 g/l of zinc ions,

from about 5 to about 250 g/l of nickel and/or cobalt ions, and

from about 0.005 to about 100 g/l of fluoride ions provided the solution is free of cyanide ions, for a period of time sufficient to deposit the desired coating, and

(B) removing the coated substrate from the immersion plating solution.

33. (Original) The process of claim 32 wherein the surface of the substrate is cleaned, etched and desmutted prior to immersion in the immersion plating solution.

34. (Original) The process of claim 33 wherein the cleaning is performed with an alkaline, acidic or solvent cleaner, and the etching is performed with an alkaline or acid etching solution.

35. (Original) The process of claim 34 wherein the substrate is rinsed with water after each of the cleaning, etching, desmutting, and immersion plating steps.

36. (Previously Presented) A process for depositing a zinc alloy protective coating on aluminum or aluminum based alloy substrate which comprises

(A) immersing the substrate in an aqueous acidic immersion plating solution having a pH of from about 4 to about 6 and comprising:

from about 10 to about 30 g/l of zinc ions,

from about 20 to about 50 g/l of nickel and/or cobalt ions,

from about 0.5 to about 10 g/l of fluoride ions, and

from about 0.005 to about 0.05 g/l of an inhibitor containing one or more nitrogen atoms, one or more sulfur atoms, or both sulfur and nitrogen atoms for a period of time sufficient to deposit the desired coating, and

(B) removing the coated substrate from the immersion plating solution.

37. (Original) The process of claim 36 wherein the surface of the substrate is cleaned, etched and desmutted prior to immersion in the immersion plating solution.

38. (Original) The process of claim 37 wherein the cleaning is performed with an alkaline, acidic, or solvent cleaner, and the etching is performed with alkaline or acid etching solution.

39. (Original) The process of claim 37 wherein the substrate is rinsed with water after each of the cleaning, etching, desmutting, immersion plating steps.

40. (Previously Presented) A process for depositing a metal coating on an aluminum or aluminum alloy substrate comprising

(A) applying an immersion zinc alloy protective coating on the substrate by immersing the substrate in an aqueous acidic immersion plating solution having a pH of from about 3.5 to about 6.5 and comprising zinc ions, nickel and/or cobalt ions, fluoride ions and at least one inhibitor containing one or more nitrogen atoms, one or more sulfur atoms, or both sulfur and nitrogen atoms provided the solution is free of cyanide ions for a period of time sufficient to deposit the desired coating, and

(B) plating the zinc alloy coated substrate using an electroless or electrolytic metal plating solution.

41. (Original) The process of claim 40 wherein the surface of the substrate is subjected to cleaning, acid etching and desmutting, prior to immersion in the immersion plating solution.

42. (Original) The process of claim 41 wherein the cleaning is performed with an alkaline, acidic, or solvent cleaner, and the etching is performed with alkaline or acid etching solution.

43. (Previously Presented) A process for depositing a metal coating on an aluminum or aluminum alloy substrate comprising

(A) applying an immersion zinc alloy protective coating on the substrate by immersing the substrate in an aqueous acidic immersion plating solution having a pH of from about 3.5 to about 6.5 and comprising:

from about 1 to about 150 g/l of zinc ions,

from about 5 to about 250 g/l of nickel and/or cobalt ions, and

from about 0.005 to about 100 g/l of fluoride ions provided the solution is free of cyanide ions, for a period of time sufficient to deposit the desired coating, and

(B) plating the zinc alloy coated substrate using an electroless or electrolytic metal plating solution.

44. (Original) The process of claim 43 wherein the surface of the substrate is subjected to alkaline, acidic or solvent cleaning, acid etching and desmutting, prior to immersion in the immersion plating solution.

45. (Original) The process of claim 44 wherein the cleaning is performed with an alkaline cleaner, and the etching is performed with alkaline or acid etching solution.

46.-49. (Cancelled)

50. (Previously Presented) The process of claim 28 wherein the plating solution also contains one or more metal complexing agents.

51. (Previously Presented) The process of claim 28 wherein the plating solution also contains one or more additional metal ions selected from copper ions, iron ions, manganese ions, magnesium ions and zirconium ions.

52. (Currently Amended) The process of claim 28 wherein the inhibitor is selected from nitrogen-containing disulfides; alkali metal thiocyanates; thiocarbamates; nitrogen-containing heterocyclic compounds; mercapto substituted nitrogen-containing heterocyclic ~~compounds, thioacids, thioalcohols, compounds~~ compounds; thioacids; thioalcohols; compounds characterized by the formula

$$R_2N\text{-}C(S)Y \qquad \text{I}$$

wherein each R is independently hydrogen or an alkyl, alkenyl, or aryl group, and Y is X R^1, NR_2 or $N(H)NR_2$; wherein X is O or S and R^1 is hydrogen or an alkali metal; and mixtures thereof.

53. (Withdrawn) The process of claim 28 wherein the inhibitor is a thiourea compound represented by the formula:

$$[R_2N]_2CS \qquad II$$

wherein each R is independently hydrogen or an alkyl, alkenyl or aryl group.

54. (Previously Presented) The process of claim 28 wherein the inhibitor is at least one nitrogen containing heterocyclic compound or mercapto substituted nitrogen containing heterocyclic compound, or mixtures thereof.

55. (Withdrawn) The process of claim 54 wherein the heterocyclic compound is selected from pyrroles, imidazoles, benzimidazoles, pyrazoles, triazoles, pyridines, piperazines, pyrazines, piperidines, pyrimidines, thiazoles, thiazolines, thiazolidines, rhodamines, and morpholines.

56. (Previously Presented) The process of claim 54 wherein the inhibitor is a mercapto substituted nitrogen containing heterocyclic compound.

57. (Previously Presented) The process of claim 28 wherein the plating solution contains

from about 1 to about 150 g/l of zinc ions, and

from about 5 to about 250 g/l of nickel and/or cobalt ions.

58. (Previously Presented) The process of claim 54 wherein the plating solution also contains from about 0.0005 to about 5 g/l of an inhibitor containing one or more nitrogen atoms, one or more sulfur atoms, or both sulfur and nitrogen atoms.

59. (Previously Presented) The process of claim 28 wherein the plating solution is free of aliphatic amines and aliphatic hydroxylamines.

60. (Previously Presented) The process of claim 32 wherein the plating solution also contains from about 0.005 to about 100 g/l of an inhibitor containing one or more nitrogen atoms, one or more sulfur atoms, or both sulfur and nitrogen atoms.

61. (Previously Presented) The process of claim 32 wherein the plating solution also contains at least one metal complexing agent.

62. (Previously Presented) The process of claim 61 wherein the metal complexing agent is selected from an acetate, citrate, glycollate, lactate, maleate, pyrophosphate, tartrate, gluconate, or glucoheptonate, and mixtures thereof.

63. (Previously Presented) The process of claim 60 wherein the inhibitor is selected from nitrogen-containing disulfides, alkali metal thiocyanates, alkali metal thiocarbamates, nitrogen-containing heterocyclic compounds, mercapto substituted nitrogen-containing heterocyclic compounds, thioacids, thioalcohols, compounds characterized by the formula

$$R_2N\text{-}C(S)Y \qquad \text{I}$$

wherein each R is independently hydrogen or an alkyl, alkenyl, or aryl group, and Y is XR^1, NR_2 or $N(H)NR_2$, wherein X is O or S and R^1 is hydrogen or an alkali metal and mixtures thereof.

64. (Withdrawn) The process of claim 60 wherein the inhibitor is a thiourea compound represented by the formula:

$$[R_2N]_2CS \qquad \text{II}$$

wherein each R is independently hydrogen or an alkyl, alkenyl or aryl group.

65. (Previously Presented) The process of claim 60 wherein the inhibitor is at least one nitrogen containing heterocyclic compound or a mercapto substituted nitrogen containing heterocyclic compound or mixtures thereof.

66. (Withdrawn) The process of claim 65 wherein the heterocyclic compound is selected from pyrroles, imidazoles, pyrazoles, triazoles, tetrazoles, thiazoles, thiazolines, thiazolidines, pyridines, piperazines, pyrazines, piperidines, pyrimidines, and morpholines.

67. (Previously Presented) The process of claim 60 wherein the inhibitor is a mercapto substituted nitrogen containing heterocyclic compound.

68. (Previously Presented) The process of claim 32 wherein the plating solution has a pH of from about 4 to about 6.

69. (Previously Presented) The process of claim 32 wherein the plating solution also contains one or more metal ions selected from copper ions, iron ions, manganese ions, magnesium ions and zirconium ions.

70. (Previously Presented) The process of claim 32 wherein the plating solution is free of aliphatic amines and aliphatic hydroxylamines.

71. (Previously Presented) The process of claim 36 wherein the plating solution also contains from about 1 to about 250 g/l of at least one metal complexing agent.

72. (Previously Presented) The process of claim 36 wherein the inhibitor is a mercapto substituted nitrogen containing heterocyclic compound.